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A new species of *Succinea* Draparnaud from extreme south of Argentina

(Mollusca, Pulmonata, Stylommatophora)

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A new species of *Succinea* from Santa Cruz Province (Argentina) is described. *Succinea argentina* sp. nov. is characterized by the following features: a shell of regular growth, 3 to 3.25 whorls, length of 6.0 to 7.15 mm, shell not succineid, opaque walls and conspicuous axial ribs; straw-yellow opaque deciduous periostracum; radular formula: 21–9–C–9–21, with central tooth tricuspid, lateral teeth bicuspid and marginal teeth tricuspid; penis with epiphallus, wrapped in a common sheath, without appendices, and formed by two regions: a long proximal region, which is lined by a mucosa with multiple transverse folds, and a short distal region, which opens into the atrium; vas deferens composed of three main regions – pre-prostatic, prostatic and post-prostatic –, entering the epiphallus subterminally, and covered by a mucosa with multiple folds of different sizes; vagina long, thin and convolute; spermatheca globose, with a long duct that opens in the last portion of the vagina; atrium short.

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Introduction

So far, seven nominal species and subspecies of *Succinea* Draparnaud, 1801 have been described for Argentina, whereas other five species have been described for southern Chile (Fernández 1973, Stuardo & Vega 1985) (Fig. 1). The first published records are those of d’Orbigny (1837), who mentioned *S. oblonga* Draparnaud, 1801 for populations of a wide area of South America, including the Río de la Plata basin. Later, the same author re-named these specimens as

S. meridionalis, remarking that European and North American *Succinea* were different (d’Orbigny 1846). In the period 1873–1881, Döring (later Doering in Spanish) added the description of some species and subspecies, including the first dissections and remarking a few features of their habitats. Based on a conchological point of view, Pilsbry (1911) analysed the distribution and synonymy of *Succinea* from Patagonia, and later, Hylton Scott (1945, 1948, 1951) described a new species from northern Argentina. Breure & Miquel (2012) established the

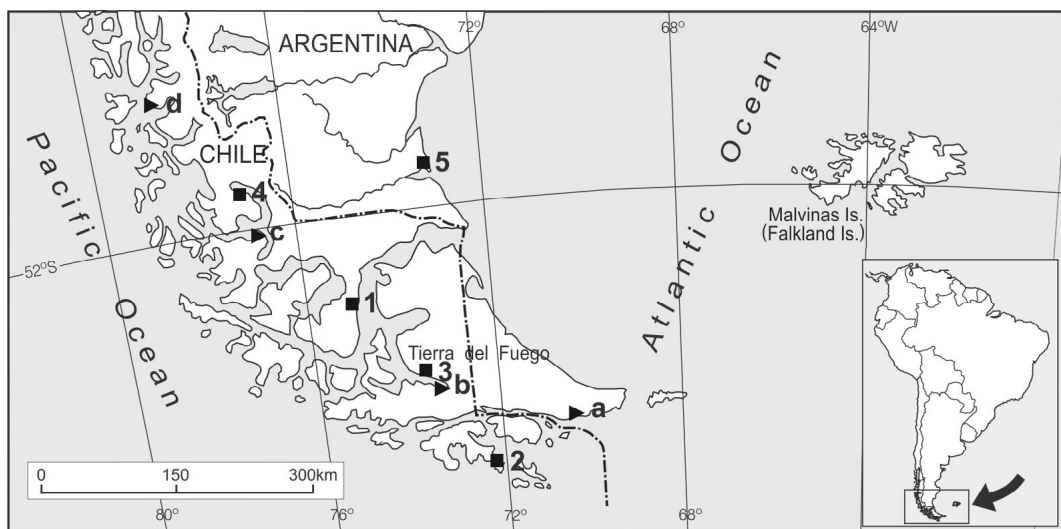


Fig. 1. Type localities of species of *Succinea* Draparnaud, 1801 living in austral South America. 1, *S. lebruni* Mabile, 1884: Punta Arenas, Chile; 2, *S. magellanica* Gould, 1846: Orange Harbor, Tierra del Fuego, Chile; 3, *S. ordinaria* Smith, 1905: Admiralty Sound, Tierra del Fuego, Chile; 4, *S. patagonica* Smith, 1881: Cockle Cove; shores of Trinidad Channel and Puerto Bueno, Última Esperanza, Chile; 5, *Succinea argentina* sp. nov.: Farm Cabo Buen Tiempo, Potrero de Rudd, Ger Aike, Santa Cruz, Argentina. Localities of studied samples of *S. magellanica*. a, Bahía Aguirre, Tierra del Fuego; b, Lago Fagnano, Tierra del Fuego; c, 30 km Natales, road to Magallanes, Chile; d, Ventisquero, Lago Argentino, Santa Cruz, Argentina.

edition dates of some contributions of Doering. In this paper, a further new species of *Succinea* from austral Argentina is described, and its shell, jaw, radula and genital apparatus are analysed.

Materials and methods

The specimens of the new species are housed in the Colección Nacional de Invertebrados in the Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" (MACN-In, Buenos Aires, Argentina). Photographs of types deposited in the Muséum National d'Histoire Naturelle (Paris, MNHN), Natural History Museum (London, NHM), Academy of Natural Sciences of Philadelphia (Philadelphia, ANSP) and United States National Museum (Washington, USNM) are included.

The images in toto were obtained with a Nikon ZMZ1000 stereoscope and Nikon Coolpix S10 and Canon T3 cameras. The genital apparatus was treated by a standard process of critical point. The photographs were taken in the Electronic Microscopy Service of the MACN (Philips XL 30 TMP model).

Two specimens were fixed and kept in ethanol 70 %, dehydrated in an ethanol gradient, cleared in xylene and embedded in Paraplast TM at 56 °C. Serial 11 µm thick longitudinal sections were obtained; the sections were rehydrated in a decreasing ethanol gradient and stained with hematoxylin and eosin (H-E), dehydrated and mounted with Histomount on standard slides. Histo-

logical images were captured with an image processing device (Carl Zeiss) consisting of an Axioplan 2 imaging optical epifluorescence microscope with an Axiocam HR colour digital scanner.

Results

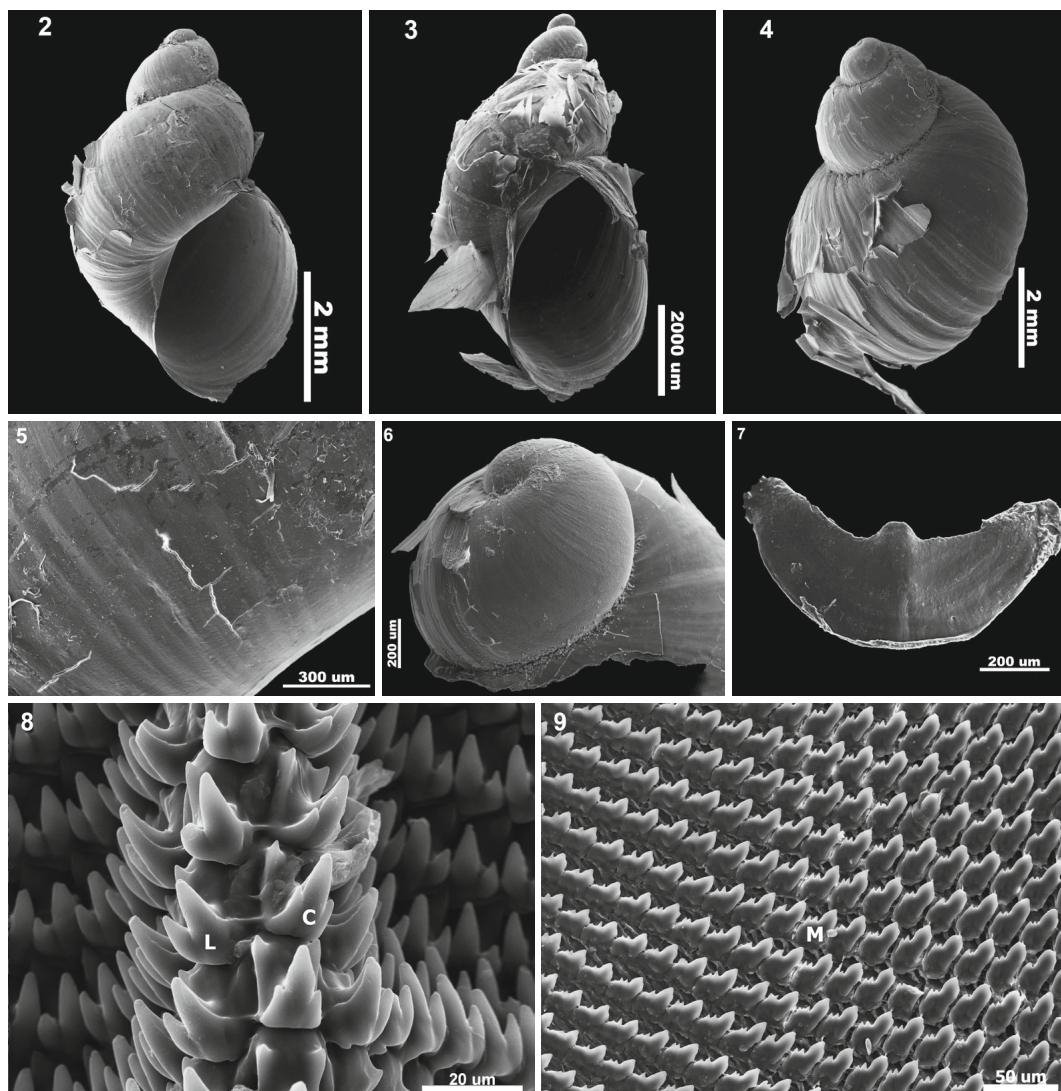
Superfamily Succineoidea Beck, 1837
Family Succineidae Beck, 1837
Genus *Succinea* Draparnaud, 1801

Succinea argentina sp. nov. Figs 2–12

Diagnosis. Shell of regular growth, 3 to 3.25 whorls, thick and brittle, length 6 to 12 mm, with only conspicuous axial ribs, periostracum straw-yellow, opaque, deciduous; radular formula: 21–9–C–9–21; penis with epiphallus, wrapped in a common sheath, without appendices.

Description

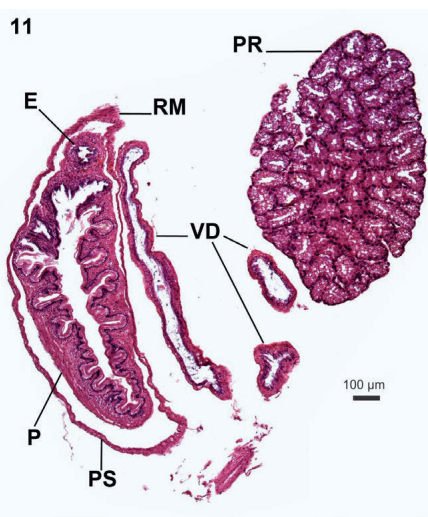
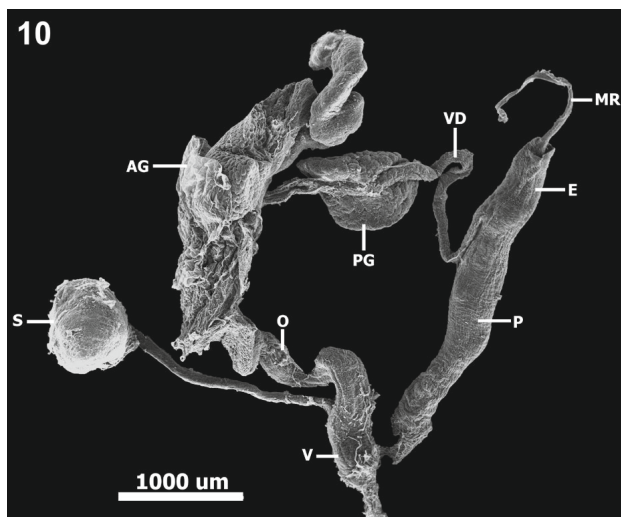
Shell oblong, 3 to 3.75 convex whorls, regular growth, thick and brittle, 6 to 12 mm in length, aperture oval, teleoconch with axial ribs conspicuous, few irregular and low spiral ribs, without cross-linked filaments; periostracum straw-yellow, opaque, easily



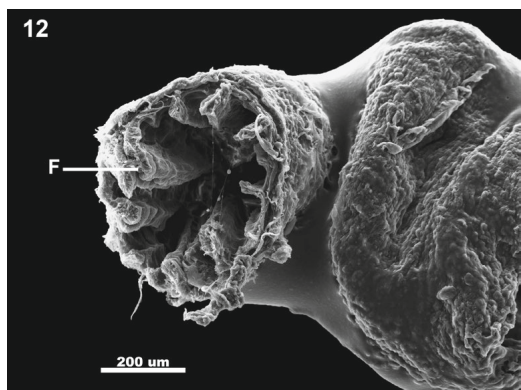
Figs 2–9. *Succinea argentina* sp. nov. MACN-In 36.975, Farm Cabo Buen Tiempo, Potrero de Rudd, Ger Aike, Santa Cruz, Argentina. **2.** Holotype MACN-In 36.975-1. **3.** Paratype. **4.** Deciduous periostracum and wrinkles growth. **5.** Detail of wall of the teleoconch. **6.** Detail of protoconch. MACN-In 36.975-2. **7.** Jaw. **8–9.** Radula: C, central tooth; L, lateral teeth; M, marginal teeth.

deciduous; spire well developed, sutures marked; callus well marked, straight; narrow columellar edge but not rimate; outer lip cutting; protoconch almost smooth and very convex, with 1.5 whorls. Roof of pulmonary cavity strongly pigmented and irregularly rough, with subcircular areas lighter. Jaw oxygnatha, with open “U” morphology, medial projection and riblets scarcely marked; radular formula: 21–9–C–9–21, central tooth tricuspid, lateral teeth bicuspid and marginal teeth tricuspid, basal

plate quadrangular. Long and thin penis, with two portions, first part longer than second one (ratio 1.6), internally covered with fimbriae; without appendices, epiphallus slightly curved, $\frac{1}{4}$ length of phallus, connected to this through papilla; penis and epiphallus wrapped in a common sheath; vas deferens going through the prostate longitudinally, penetrating the epiphallus subterminally, muscle retractor attached to its base; well-developed prostate, with moruloid structure; vagina long, thin and



Figs 10–11. *Succinea argentina* sp. nov. MACN-In 36.975, Farm Cabo Buen Tiempo, Potrero de Rudd, Ger Aike, Santa Cruz, Argentina. **10.** General morphology of the genital apparatus: AD, adenomeres; AG, albumen gland; E, epiphallus; HD, hermaphrodite duct; O, oviduct; P, penis; PR, prostate; PS, penial sheath; RM, retractor muscle; S, spermatheca (gametolytic gland); TF, transverse folds; V, vagina; VD, vas deferens. **11.** General aspect of histological structure of the genital apparatus.



Figs 12. *Succinea argentina* sp. nov. MACN-In 36.975, Farm Cabo Buen Tiempo, Potrero de Rudd, Ger Aike, Santa Cruz, Argentina. **12.** Penis with fimbriae (F) inside.

convolute; spermatheca (gametolytic gland) globose, long duct opening in last portion of the vagina; albumen gland large; atrium short.

Type series. MACN-In 36.975. Holotype (dry) MACN-In 36.975-1. 5 paratypes (dry) + 21 paratypes (in ethanol) (adults) + 7 juv. specimens. Farm Cabo Buen Tiempo, Potrero de Rudd, Ger Aike, Santa Cruz, Argentina. Col. M. I. Hylton Scott and M. Birabén, 22/II/1953.

Other specimens studied (not types). MACN-In 36.975-2: 3 (dry) + 6 (in ethanol). Provenance similar to that of type series.

Distribution. Santa Cruz Province, Argentina. It is distributed in the Magellan region (Fig. 1).

Morphology and histology of the genital apparatus (Figs 10–12). The vas deferens crosses the prostate gland longitudinally, where it receives the secretion of prostatic adenomeres radially oriented. The vas deferens is composed of three main regions: the pre-prostatic portion, which is lined by a simple columnar secretory epithelium, the prostatic portion, which sharply becomes lined by a cuboidal epithelium, and the post-prostatic portion, which is lined by a columnar epithelium that gradually decreases in height until the most distal region, near the epiphallus. A typical characteristic of this last portion is the presence of “calcium cells”. The vas deferens communicates with the epiphallus subterminally (Figs 10–11), then enters the penial sheath, runs through this tissue for a short distance,

Table 1. Measurements of *Succinea argentina* sp. nov. (mm).

	Shell height	Shell diameter	Aperture (diameter × height)	Number of whorls
Holotype	9.35	4.95	5.45 × 3.25	3.75
Paratype	6.75	4.55	4.55 × 2.85	3.50
Paratype	6.90	3.65	4.15 × 2.60	3.50
Paratype	11.45	5.45	6.60 × 4.30	3.75

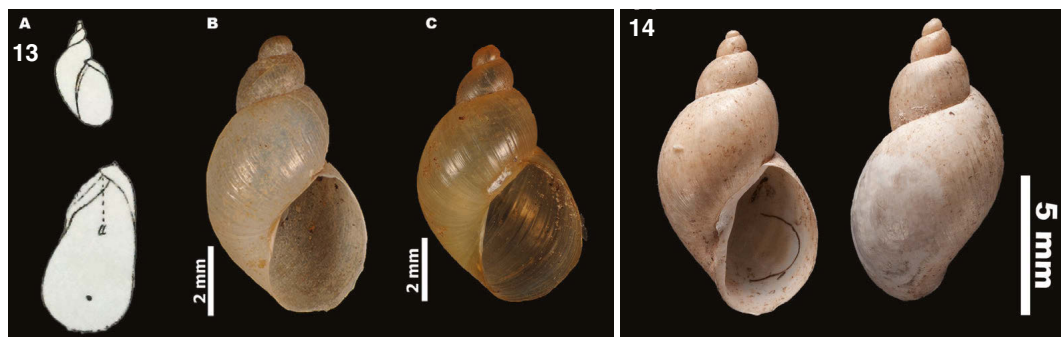


Fig. 13. *Succinea burmeisteri* Döring, 1873. A. Reproduction of original figure (the specimen measures 12.0 mm). B. ANSP 99867, stream near mouth of Río Belgrano, Patagonia. C. ANSP 99869, south side of Santa Cruz River, 15 miles above mouth, near Pescadores.

Fig. 14. *Succinea falklandica* Smith, 1884. Syntype: NHMUK 1884.6.12.694-697, Pembroke Point, Falkland Islands (Cabo San Felipe, Islas Malvinas).

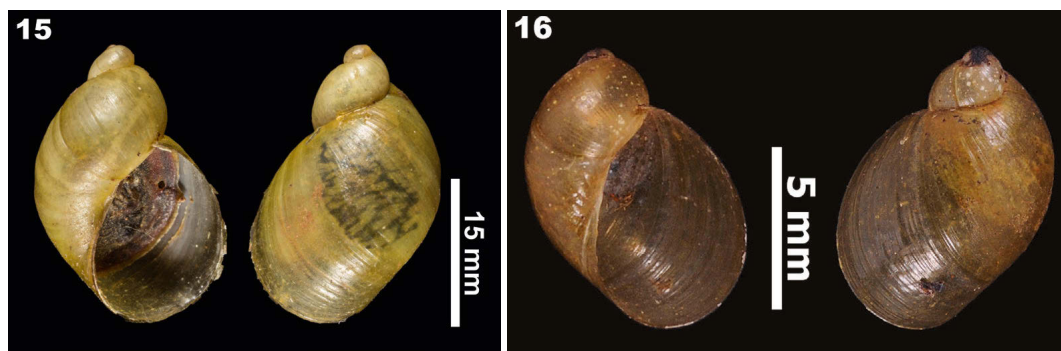


Fig. 15. *Succinea lebruni* Mabilie, 1884. Syntype: MNHN Paris 2000-30766, Punta Arenas, Chile.

Fig. 16. *Succinea magellanica* Gould, 1846. Holotype: USNM 5422, Orange Harbor, Tierra del Fuego, Chile.

and afterwards, the muscular-connective layers and lumens of both organs contact and merge. The lumen of the epiphallus is covered by a mucosa with multiple folds of different sizes; it also displays “calcium cells”. The connective-muscular tissue of the distal epiphallus continues, without a clear demarcation, with that of the penis. Both organs communicate by means of a papilla. The penis has two main regions: a long proximal region, which is lined by a mucosa with multiple transverse folds (simple columnar secretory epithelium covered by a dense basophilic secretion) and whose connective tissue shows numerous “calcium cells” and dense bundles of collagen fibers that form the axis of each fold, and a short distal region, which is lined by a simple epithelium whose cells vary from cuboidal to columnar. The stromal connective tissue of the mucosa becomes more vascular and possesses a higher density of large “calcium cells”. Before connecting the atrium, its connective layer is reflected and

continues with the penial sheath (Fig. 11). A small terminal portion of the distal penial region extends beyond the penial sheath and the connective tissue of this region continues with the connective tissues of the adjacent structures.

Comparisons and discussion Figs 13–22

Succinea argentina sp. nov. shows ribs parallel to the growth lines, only; a similar design is present in *S. magellanica* Gould, 1846 (Figs 6, 16, 17A), with spiral notch almost imperceptible; the nepionic shells of both species show growth wrinkles similar to those present in their teleoconchs (Fig. 17B,C). Besides, the new species is different from *S. magellanica*, *S. lebruni* Mabilie, 1884 (Fig. 15), and *S. patagonica* Smith, 1881 (Fig. 21) in the shell morphology: the last whorl occupies 60 % of the total length of the shell, with

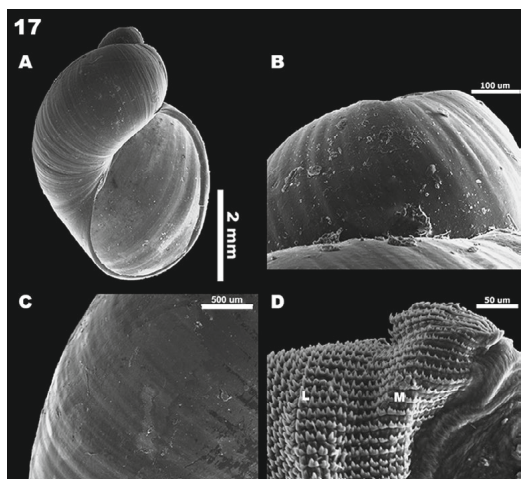


Fig. 17. *Succinea magellanica* Gould, 1846. MACN-In 36.974, 30 km de Natales, camino a Magallanes, Chile. **A.** General morphology. **B.** Detail of wall of teleoconch. **C.** Detail of the protoconch, MACN-In 1.406, Ushuaia, Tierra del Fuego, Argentina. **D.** Radula: L, lateral teeth; M, marginal teeth.

well-marked growth wrinkles and periostracum straw-yellow, opaque and deciduous vs. 90 % of the total length of the shell, slightly marked growth wrinkles

and a periostracum brown to chestnut-greenish in the species mentioned. Some of the species of the austral region such as *S. falklandica* Smith, 1884 and *S. patagonica* (more than 12 mm in total length) are larger than the new species.

Succinea argentina differs from *S. ordinaria* Smith, 1905 (Fig. 20) in the shell not succineid, with stronger opaque walls, and without irregularly distributed brown stripes. Hylton Scott (1963) explained that *S. ordinaria* is an abundant species in the Patagonian plateau, and remarked that it could be a synonym of *S. magellanica*. Nevertheless, both species exhibit remarkable conchological differences. The new species is different from *S. falklandica* (Fig. 14) – endemic to Malvinas Islands (Falkland Islands) – in its smaller size, its aperture less prolonged and not rimate. *S. argentina* differs from *S. m. meridionalis* (Fig. 18A–C) from eastern South America, and from *Succinea meridionalis cornea* Döring, 1873 (Fig. 19A,B), described and recorded for central Argentina (Döring 1877, 1878, 1881), in its opaque walls, with no crisscrossed ribs (oblique respect to growth lines) and deciduous periostracum (Figs 18C, 19C). None of these species has a deciduous periostracum, characteristic of *S. argentina*.

Regarding the digestive system, the jaw of *S. argentina* has an open “U” morphology, with a medial projection, surface almost smooth (Fig. 7),

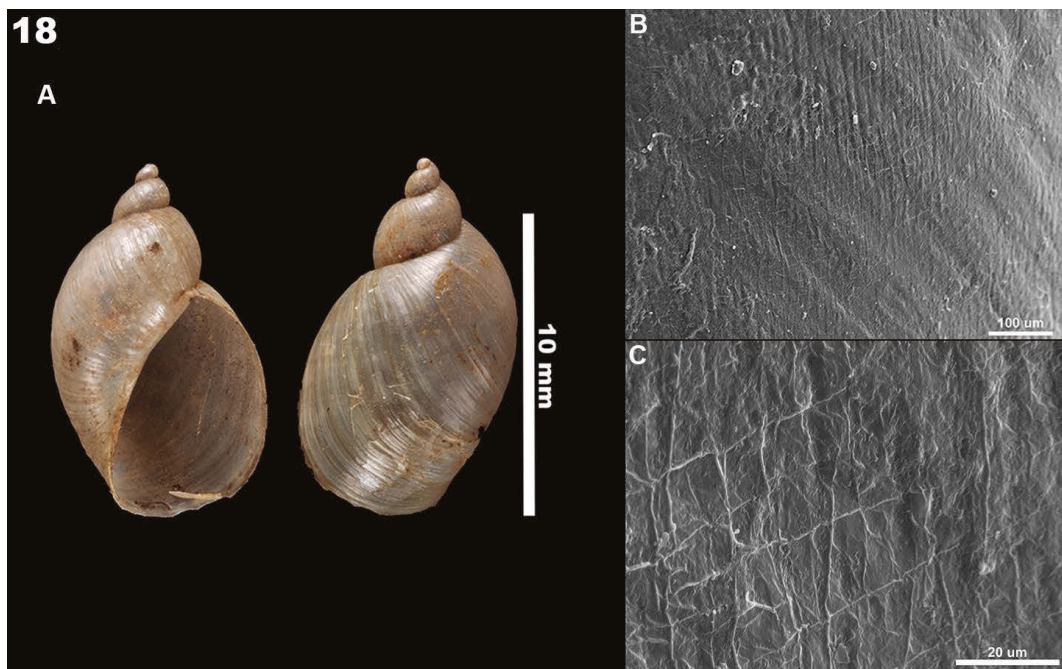


Fig. 18. *Succinea meridionalis meridionalis* d'Orb., 1846. **A.** Syntypes: NHMUK 1854.12.4.49, Bahía San Blas, Argentina. MACN-In 20.094, Zelaya, Buenos Aires Province, Argentina. **B–C.** Detail of the wall of teleoconch.

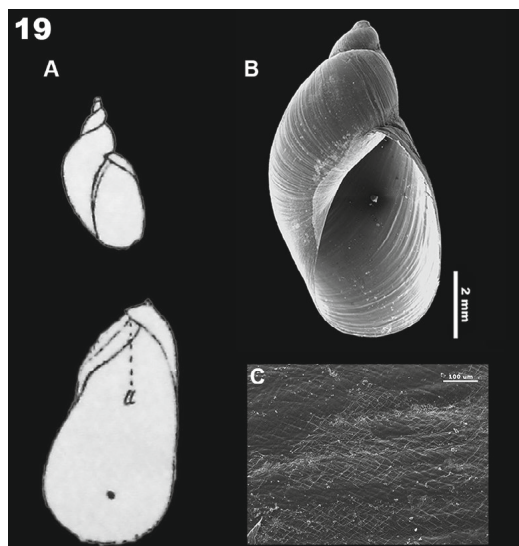


Fig. 19. *Succinea meridionalis cornea* Döring, 1873. A. Reproduction of original figure (the specimen measures 7.0 mm). B. *Succinea meridionalis* aff. *cornea* Döring, 1873. MACN-In 20.281, Carmen de Patagones, Buenos Aires, Argentina. C. Detail of the wall of teleoconch.

a little different from that of *S. aurita* Hylton Scott, 1951 – from Jujuy Province, Argentina –, which has very conspicuous accessory ribs; its radula has fewer teeth (3–10–9–C–9–10–3, Hylton Scott 1945) than the new species (21–9–C–9–21, Figs 8–9). Lanzieri (1965) described specimens of *Succinea meridionalis* collected near Rio de Janeiro (Brazil), remarking that its radula – very variable – has the formula 25/30–C–25/30, its central tooth has a central cusp elongated with lateral cusps very small. In the new species, the lateral cusps are more developed than the central cusp.

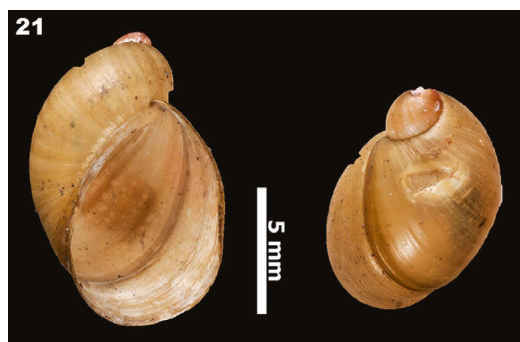


Fig. 21. *Succinea patagonica* Smith, 1881. Syntypes: NHMUK 1879.10.15.95–99, Cockle Cove; shores of Trinidad Channel and Puerto Bueno, Última Esperanza, Chile.



Fig. 20. *Succinea ordinaria* Smith, 1905. Syntype: NHMUK 1905.8.11.42–43, Admiralty Sound, Tierra del Fuego, Chile.

S. magellanica has a radular formula 14–7–C–7–14, with central tooth tricuspid, lateral teeth bicuspid and marginal teeth tricuspid; this radula has fewer teeth than those of *S. argentina*, here illustrated for the first time (Fig. 17D).

In relation to the genital apparatus, the brief original descriptions made by Döring (1873) for *S. burmeisteri* (Figs 1, 13A–C, 22B) and *S. rosariensis*, from Santa Fe Province (Fig. 22C), and by Hylton Scott (1945) for *S. aurita* (Fig. 22A) do not allow very accurate comparisons. Nevertheless, it is possible to see that the main features of *S. argentina* (Figs 10, 11) are similar to those of the above-mentioned species, principally to *S. aurita*, but clearly different in its hard parts, shell and radula. The original image of the genital system of *S. burmeisteri* (Fig. 22B) shows a small prostate and that the vas deferens and the penial muscle retractor are coalescent and enter the penial complex together by its proximal extreme. In contrast, in the new species, the vas deferens enters the epiphallus subterminally, and a muscle retractor

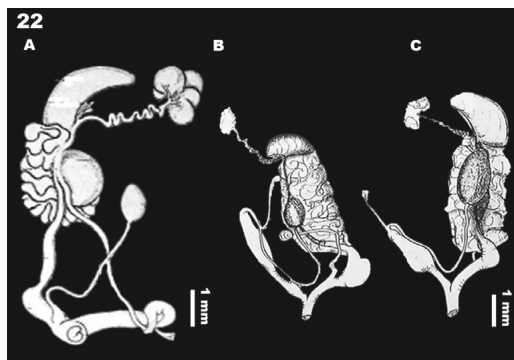


Fig. 22. Reproduction of original figures of genital apparatus of Argentinian species. A. *Succinea aurita* Hylton Scott, 1951. B. *Succinea burmeisteri* Döring, 1873. C. *Succinea rosariensis* Döring, 1873.

is attached to its base. In *S. rosariensis*, the penis is shorter and robust, and the atrium is well developed.

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Annex 1: Other studied materials

- Succinea burmeisteri*: ANSP 99855, big spring on Rio Chico, 15 and 25 mi. above Sierra Oveja. ANSP 178648, north of San Julián, Magallanes.
- Succinea magellanica*: MACN-In 36.969, Ventisquero, Lago Argentino, Santa Cruz, Argentina, Col. M. R. Birabén-Scott, 7 exs. MACN-In 36.970, Ventisquero, Lago Argentino, Santa Cruz, Argentina, Col. M. R. Birabén-Scott, 7 exs. MACN-In 36.972, Lago Fagnano, Tierra del Fuego, Argentina, Col. M. Birabén, 4/X/1964, 9 exs. MACN-In 36.973, Bahía Aguirre, Tierra del Fuego, Argentina, 2 exs.
- Succinea meridionalis meridionalis*: MACN-In 9.566, Punta Lara, Buenos Aires, Col. M. D. Jurado, 17/I/1912, 2 exs. MACN-In 30.494, Punta Lara, Buenos Aires, Col. I. B. Daguerre, 8/VI/1931, 2 exs.